Section I. (Amendments to the Claims)

Please amend claims by canceling claim 12, and amending claims 1, 13-19, 31, 70, 74, 75, 76, 78 and 81, as set out in the following listing of claims 1-85 of the application.

1. (Currently amended) A fusion protein comprising:

(a) one or more biological molecules selected from the group consisting of peptides and proteins;

(b) one or more phase transition proteins that exhibit an inverse phase transition, wherein the one or more phase transition proteins are joined to the biological molecule(s) of (a); and

(c) optionally, a spacer sequence separating any of the phase transition protein(s) of (b) from any of the biological molecule(s) of (a),

wherein the fusion protein retains the inverse phase transition behavior of the phase transition protein(s) of (b) and wherein said phase transition protein(s) has a molecular weight of at least 9,000 Daltons, and

wherein the one or more phase transition protein(s) of (b) comprises oligomeric repeats of the pentapeptide Val-Pro-Gly-X-Gly, wherein X is any natural or non-natural amino acid residue, and wherein X optionally varies among oligomeric repeats.

2. (Cancelled).

3. (Original) The fusion protein of claim 1 wherein the biological molecule of 1(a) comprises a peptide.

4. (Original) The fusion protein of claim 1 wherein the biological molecule of 1(a) comprises a biologically active protein.

5. (Original) The fusion protein of claim 1 wherein the biological molecule of 1(a) comprises a therapeutic protein.

6. (Original) The fusion protein of claim 1 wherein the biological molecule of 1(a) comprises an enzyme useful in industrial biocatalysis.

7. (Original) The fusion protein of claim 1 wherein the biological molecule of 1(a) comprises an antibody or antibody fragment.

8. (Previously presented) The fusion protein of claim 7 wherein the antibody or antibody fragment has complex forming affinity for an antigenic protein of interest, and wherein upon binding to the antigenic protein of interest, the fusion protein retains its phase transition character.

9. (Previously presented) The fusion protein of claim 1 wherein the phase transition is mediated by one or more means selected from the group comprising:

changing temperature;

changing pH;

addition of solutes and/or solvents,

side-chain ionization or chemical modification; and

changing pressure.

10. (Original) The fusion protein of claim 1 wherein the phase transition is mediated by means comprising raising temperature.

11. (Cancelled).

12. (Cancelled).

13. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the X component(s) of the oligomeric repeats comprise(s) a naturally-occurring amino acid residue.

14. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the X component(s) of the oligomeric repeats comprise(s) a non-naturally-occurring amino acid residue.

15. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the X component(s) of the oligomeric repeats comprise(s) one or more amino acid residues selected from the group consisting of: alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine and valine residues.

16. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein any two or more of the oligomeric repeats are separated by one or more amino acid residues which do not eliminate the phase transition characteristic of the fusion protein.

17. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the ratio of Val-Pro-Gly-X-Gly oligomeric repeats to other amino acid residues of the phase transition protein(s) of 1(b) is greater than about 75%.

18. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the ratio of Val-Pro-Gly-X-Gly oligomeric repeats to other amino acid residues of the phase transition protein(s) of 1(b) is greater than about 85%.

19. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the ratio of Val-Pro-Gly-X-Gly oligomeric repeats to other amino acid residues of the phase transition protein(s) of 1(b) is greater than about 95%.

20. (Cancelled).

21. (Previously presented) The fusion protein of claim 1 wherein the spacer sequence comprises a proteolytic cleavage site.

22. (Original) The fusion protein of claim 1 wherein the fusion protein further comprises a signal peptide.

23. (Original) The fusion protein of claim 22 wherein the signal peptide is cleavable from the fusion protein by enzymatic cleavage.

24. (Original) The fusion protein of claim 22 wherein the signal peptide directs secretion of the fusion protein from the cell.

25. (Previously presented) The fusion protein of claim 1 wherein the fusion protein is recombinantly produced.

26. (Previously presented) The fusion protein of claim 1 wherein any of the biological molecule(s) of 1(a), phase transition protein(s) of 1(b), or spacer sequence of 1(c) (when present) is recombinantly produced.

27. (Previously presented) A fusion protein comprising:

(a) one or more biological molecules selected from the group consisting of peptides and proteins;

(b) one or more phase transition protein(s) that exhibit an inverse phase transition, wherein the one or more phase transition protein(s) are joined to the biological molecule(s) of (a); and

(c) optionally, a spacer sequence separating any of the phase transition protein(s) of (b) from any of the biological molecules of (a),

wherein the fusion protein retains the inverse phase transition behavior of the phase transition proteins of (b) and wherein said phase transition protein(s) comprises at least thirty repeats of the pentapeptide Val-Pro-Gly-X-Gly, in which X is any natural or non-natural amino acid residue.

28. (Original) The fusion protein of claim 27 wherein the phase transition is mediated by means comprising raising temperature.

29-30. (Cancelled).

31. (Currently amended) A fusion protein comprising:

(a) one or more biological molecules selected from the group consisting of peptides and proteins;

(b) one or more phase transition proteins that exhibit an inverse phase transition, wherein the one or more phase transition proteins are joined to the biological molecule(s) of (a); and

(c) optionally, a spacer sequence separating any of the phase transition protein(s) of (b) from any of the biological molecule(s) of (a),

wherein the fusion protein retains the inverse phase transition behavior of the phase transition proteins of (b), wherein said phase transition protein(s) comprises oligomeric repeats of the pentapeptide Val-Pro-Gly-X-Gly, in which X is any natural or non-natural amino acid residue, and wherein said phase transition protein(s) has a molecular weight of at least 9,000 Daltons.

wherein the one or more biological molecules of (a) is proteolytically cleavable from the fusion protein; and

wherein the phase transition is mediated by one or more means selected from the group comprising: changing temperature; changing pH; addition of solutes and/or solvents, side-chain ionization or chemical modification; and changing pressure.

32. (Original) The fusion protein of claim 31 wherein the phase transition is mediated by raising temperature.

33-61. (Cancelled).

62. (Withdrawn) A method of optimizing size of an ELP expression tag incorporated in a polynucleotide comprising a nucleotide sequence encoding a fusion protein exhibiting a phase transition, wherein the fusion protein comprises a protein of interest, said method comprising the steps of (i) forming a multiplicity of polynucleotides comprising a nucleotide sequence encoding a fusion protein exhibiting a phase transition, wherein each of said multiplicity of polynucleotides includes a different-sized ELP expression tag, (ii) expressing corresponding fusion proteins from said multiplicity of polynucleotides, (iii) determining a yield of the desired protein for each of said corresponding fusion proteins, (iv) determining size of particulates for each of said corresponding fusion proteins in solution as temperature is raised above T_t, and (v) selecting an optimized size ELP expression tag according to predetermined selection criteria for maximum recoverable protein of interest from among said multiplicity of polynucleotides.

63. (Withdrawn) A method of purification of fusion proteins to yield a protein of interest, comprising forming a polynucleotide comprising a nucleotide sequence encoding a fusion protein exhibiting a phase transition, expressing the fusion protein in culture, and subjecting a fusion protein-containing material from said culture to processing involving centrifugation and inverse transition cycling to recover said protein of interest.

64. (Withdrawn) The method of claim 63, comprising expressing the fusion protein in culture in a well of a microplate.

65. (Withdrawn) The method of claim 63, comprising processing the fusion protein-containing material from said culture in a well of a microplate.

66. (Previously presented) The fusion protein of claim 9, wherein the phase transition is mediated by addition of solute.

67. (Previously presented) The fusion protein of claim 66, wherein the solute comprises an organic solute.

68. (Previously presented) The fusion protein of claim 66, wherein the solute comprises an ionic solute.

69. (Previously presented) The fusion protein of claim 68, wherein the ionic solute comprises a salt.

70. (Currently amended) The fusion protein of claim ~~66~~ 69, wherein the salt comprises NaCl.

71. (Previously presented) An elastin-like polypeptide (ELP) fusion protein comprising a protein of interest and an elastin-like polypeptide component coupled by a cleavage site in a composition comprising a solvent medium in which the ELP fusion protein exhibits an inverse phase transition wherein the phase transition is mediated by at least one change selected from the group consisting of:

(a) changing temperature;

(b) changing pH;

(c) addition of solutes and/or solvents;

(d) side-chain ionization or chemical modification; and

(e) changing pressure,

wherein the phase transition protein(s) of (b) comprises oligomeric repeats of the pentapeptide Val-Pro-Gly-X-Gly, in which X is any natural or non-natural amino acid residue, and wherein said phase transition protein(s) has a molecular weight of at least 9,000 Daltons.

72. (Previously presented) The ELP fusion protein of claim 71, wherein the protein of

interest is cleavable from the elastin-like polypeptide component at the cleavage site to yield the protein of interest and the elastin-like polypeptide component as cleavage products.

73. (Cancelled).

74. (Currently amended) The ~~ELP~~ fusion protein of claim ~~72~~ 1, wherein ~~the protein of interest~~ said one or more biological molecules of (a) is cleavable from the ~~elastin-like polypeptide component at the cleavage site~~ fusion protein by a cleavage agent ~~to yield the protein of interest and the elastin-like polypeptide component as cleavage products~~.

75. (Currently amended) The ELP fusion protein of claim ~~74~~ 72, wherein said cleavage agent is a proteolytic agent for proteolytically cleaving the cleavage site of the ELP fusion protein.

76. (Currently amended) The fusion protein of claim ~~12~~ 1 wherein the phase transition protein(s) comprise a β-turn structure.

77. (Cancelled).

78. (Currently amended) The fusion protein of claim 27, ~~wherein the~~ having a phase transition temperature ~~is~~ in a range of from about 35 to about 60°C.

79. (Previously presented) The fusion protein of claim 1 wherein the phase transition protein(s) of (b) are joined to the N-terminus of the biological molecule(s) of (a).

80. (Previously presented) The fusion protein of claim 21 wherein the proteolytic cleavage site is cleavable by a protease agent selected from the group consisting of serine, cysteine, aspartyl and metallo-proteases.

81. (Currently amended) A fusion protein comprising:

(a) one or more biological molecules selected from the group consisting of peptides, therapeutic proteins and antibodies or antibody fragments;

(b) one or more phase transition proteins that exhibit an inverse phase transition, wherein

the one or more phase transition proteins are joined to the biological molecule(s) of (a); and

(c) optionally, a spacer sequence separating any of the phase transition protein(s) of (b) from any of the biological molecule(s) of (a),

wherein the one or more phase transition proteins of (b) comprises at least thirty repeats of the pentapeptide Val-Pro-Gly-X-Gly, in which X is any natural or non-natural amino acid residue,

wherein the phase transition is mediated by one or more means selected from the group comprising: changing temperature; changing pH; addition of solutes and/or solvents, side-chain ionization or chemical modification; and changing pressure,

wherein the fusion protein retains the inverse phase transition behavior of the one or more phase transition proteins of (b), and wherein the one or more phase transition ~~protein(s)~~ proteins of (b) has a molecular weight of at least 9,000 Daltons.

82. (Previously presented) A fusion protein comprising:

(a) one or more biological molecules selected from the group consisting of superoxide dismutase, interferon, asparaginease, glutamase, arginase, arginine deaminase, adenosine deaminase ribonuclease, trypsin, chromotrypsin, papin, insulin, calcitonin, adrenocorticotropic hormone (ACTH), glucagon, somatosin, somatropin, somatomedin, parathyroid hormone, erthyropoietin, hypothalamic releasing factors, prolactin, thyroid stimulating hormones, endorphins, enkephalins, and vasopressin;

(b) one or more phase transition proteins that exhibit an inverse phase transition, wherein the one or more phase transition proteins are joined to the biological molecule(s) of (a), and wherein said phase transition protein(s) comprises oligomeric repeats of the pentapeptide Val-Pro-Gly-X-Gly, in which X is any natural or non-natural amino acid residue; and

(c) optionally, a spacer sequence separating any of the phase transition protein(s) of (b) from any of the biological molecule(s) of (a),

wherein the fusion protein retains the inverse phase transition behavior of the phase

transition proteins of (b).

83. (Withdrawn) A method of conducting biocatalysis including the steps of adding a biocatalytic enzyme to a solution to facilitate biocatalysis therein in production of a product, and isolating the enzyme from the solution to separate the enzyme from the product, wherein the enzyme comprises an enzyme-fusion protein (EFP), wherein the EFP comprises an ELP.

84. (Withdrawn) The method of claim 83, wherein the enzyme after separation is recycled for subsequent rounds of biocatalysis.

85. (Withdrawn) A biocatalysis process, comprising use of an enzyme-fusion protein including an ELP to facilitate said biocatalysis.